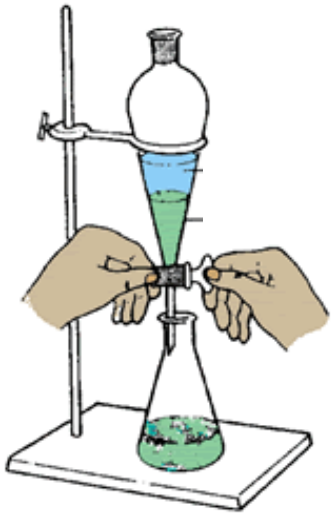
THE FINAL WORD



The official e-newsletter
of
Industrial Chemistry (IC) Department,
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OCTOBER - 2021

M. Sc. Industrial Chemistry

Industrial Chemistry Department

POSTER MAKING

On wildlife conservation week starting held from 4th October 2021 to 10th October 2021 in which several competitions were arranged like poster making competition and quiz. Students of our department grabbed 1st and 2nd position. Shree Jaradi and Saloni Ghodasara secured 1st position and Riya Uteshiya and Swapnil Patel secured 2nd position.

EXPERT TALK

Dr. Raju Rathod

Topic: My Cup of Tea'

Date: 08,October 2021

He gave us valid information regarding industries and our carrier. He introduced a new term for us called 'My cup of tea' which gives deep thinking related to our life. It was really fun and excited sections for us which gave life beyond chemistry and industry.

Mr Krunal Patel

Topic: Quality Assurance

Date : 09, October 2021

EXPERT TALK

Dr Gaurang Vyas

Topic : GLP-General Industrial requirement

Date : 13, October 2021

He gave us an overview of industry, what mindset to keep while working, how to decide which field we want to chose and he explained in detail about all the fields of industry like production, RnD, PD, QC, QA, etc.



Mr Ronak Khosla

Topic: Role of Supply Chain Management in Industry

Date: 14, October 2021



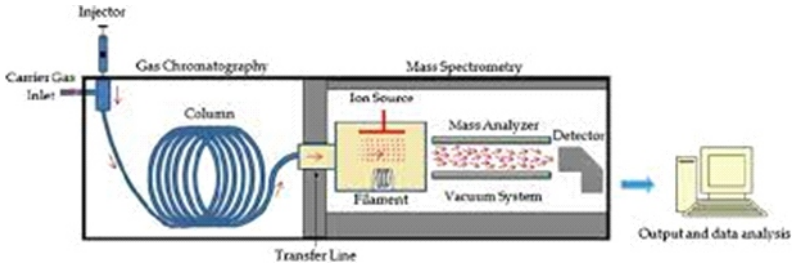
ARTICLE

Oleochemicals from Palm oil for Petroleum Industry

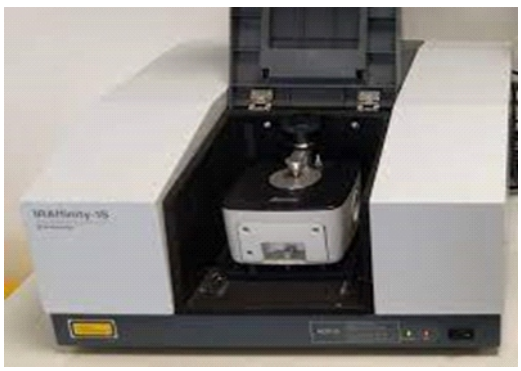
Abstract:

Waste vegetable oils as a sustainable, low-cost and low-toxicity feedstock are attracting more interests for the production of oleochemicals that are excellent substitutes for petroleum-based chemicals widely used in the petroleum industry.

The compounds resulting from transesterification-epoxidation-sulfonation of waste vegetable oils have great potential as bio-based surface-active agents with extensive application in the petroleum industry. The article focuses on cost-effective processes to convert waste palm oil into high-grade surfactants aiming at its filed application in petroleum production to enhance recovery of crude oils from reservoir. The first section focused on the formulation of a high-performance bifunctional solid catalyst with basic and acidic sites that are able to mediate simultaneous esterification and transesterification reactions. In the second part, the methyl esters were epoxidized and then sulfonated to produce the anionic surfactant.



The feedstock and the methyl ester produced were analysed with gas chromatography - mass spectrophotometer (GC-MS).



The sulfonated functional group (S- O) was detected using Fourier-transform infrared spectroscopy (FTIR) analysis.

Introduction:

A cost-effective and sustainable supply of energy sources is of enormous importance to the economy and national security. Oleochemicals are chemicals derived from chemical resources that are majorly oils and fats of vegetable and animal origin.

Basic oleochemicals include fatty acids, methyl esters, fatty alcohols of these fatty acids and glycerol as well as fatty amine. With a better understanding of oleochemistry, researchers now variously functionalize triglycerides in vegetable oils to manufacture different useful products. The structure of oleochemicals with the presence of long-chain methylene sequences facilitates a ready functionalization into a wide range of products. Fatty acid methyl esters (FAME) and fatty acid ethyl esters (FAEE) are produced from transesterification of glycerides with methanol and ethanol, respectively.

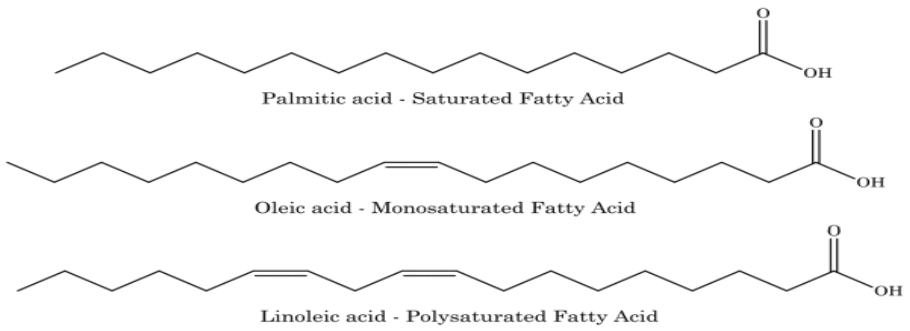
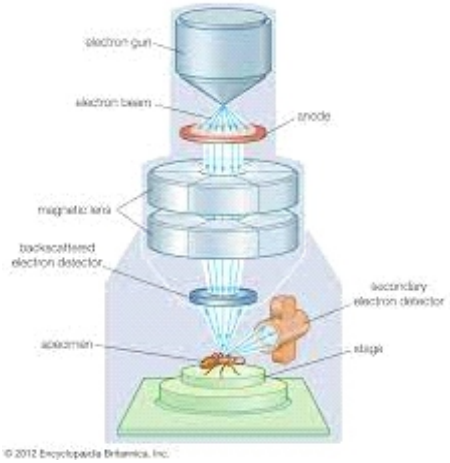


Fig: Classification triglyceride molecules

the goal is to use the fatty acid esters from waste vegetable oils to produce bio-based surfactants. The processes involved simultaneous esterification and transesterification of waste palm oil over bifunctional heterogeneous catalyst to produce alkyl esters (majorly methyl or ethyl esters) and glycerol.

The catalyst esterified the FFA into methyl esters in a one-step process and hence eliminated the pre-treatment step. The first section of this study focused on formulation of a high performance bifunctional solid catalyst, CaO/Al_2O_3 with basic and acidic sites that are able to mediate simultaneous esterification and

transesterification reactions for the production of methyl esters from waste vegetable oils. This is necessitated by the high FFA content of waste palm oil.



The SEM-EDX analysis of the catalyst confirmed the presence of Ca(CaO) and Al(Al2 O3).

The acidic oxide eliminated the need for the removal of the FFA by converting it to esters via the esterification reaction. The esterification step facilitated by the acidic oxide eliminate acid pre-treatment step which is required to remove the FFA and hence costly and as well required disposal of the fatty acid (wastes). The reaction with methanol was investigated over the catalyst in a well stirred batch reactor at an optimum reaction condition.

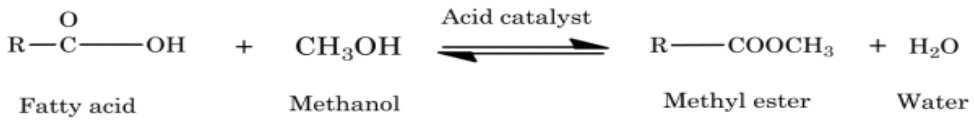
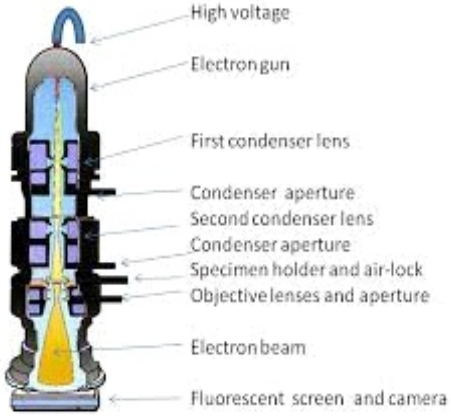


Fig: Esterification of free fatty acid reaction

The high esters yield obtained despite the low quality of the oils used demonstrated that the use of a bifunctional catalyst will provide an opportunity to lower the cost of production of the esters. Furthermore, the catalyst showed substantial chemical stability and could be used again for at least 8 times with minor losses in its catalytic activity. It is evident that the saturated fatty acid contents methyl esters to epoxy esters.

Fat/oil	Carbon chain (%)										
	8	10	12	14	16	18	18:01	18:02	18:03	20:01	22:01
Tallow				4	30	20	40	5	1		
Palm				2	42	5	41	10			
Soya					8	5	28	53	6		
Palm kernel	4	5	51	15	7	1	15	2			
Coconut	8	7	48	17	9	1	7	2	1		

fig : Fatty acid distribution of common fats and oils



The porosity of the catalyst particles was confirmed by the TEM image and most of the crystal particles were in rectangular shape.

Waste or used vegetable oils are cheap source of triglycerides and are widely available in large quantities worldwide. About 29 million tons of waste cooking oil are generated every year. Some of waste vegetable oil is utilized in soap making, but the larger volumes are dumped into rivers and landfills with its attendant environmental pollution. The use of waste cooking oil to produce oleochemicals will assist in the reduction of this environmental issue and, at the same time, lowers the cost of production.

- Megha Mohan (21IC58)

Sweet Words from Family

"It is a matter of pride and honour for me to write a few lines about the IC department. It is not just an academic functioning department, it's a home for holistic development for their stakeholders, which includes, knowledge gaining, knowledge dissemination, training and absorbance to corporate sector"

Dr. Mehulkumar L. Savaliya
Assistant Professor
Department of Industrial Chemistry
Atmiya University
Rajkot-Gujarat, INDIA.